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### HUGH L. DRYDEN RECEIVES REED AWARD

Hugh L. Dryden, chief of the Bureau's Mechanics and Sound Division, received the Sylvanus Albert Reed Award of the Institute of the Aeronautical Sciences at the Annual Honors Night dinner, which was held at the Biltmore Hotel in New York on the evening of January 28.

The Reed award, which is conferred annually for notable contributions to the sciences relating to aeronautics, was endowed in 1933 through a bequest to the Institute by the late S. A. Reed, designer of metal aircraft propellers.

Dr. Dryden was selected for this honor "for his contributions to the mechanics of boundary layer flow and to the interpretation of wind tunnel experiments." He joined the Bureau's staff in 1918, and has published many papers in the field of aerodynamics. In December 1938, he was selected to give the annual Wright Brothers Lecture, (Technical News Bulletin 261 (January 1939)), and last year was made an Honorary Fellow of the Institute.

In acknowledging the award, Dr. Dryden spoke of the credit due to his associates in the air-flow studies and to Dr. Briggs, Director of the Bureau, and Dr. Lewis, Director of Aeronautical Research of the National Advisory Committee for Aeronautics, for their sympathetic interest in and wholehearted support of the work. He referred to the important influence of such awards as that endowed by Dr. Reed which "consciously or unconsciously influence every worker in the field, stimulating them to greater efforts."

The banquet was attended by leaders in aeronautics and allied sciences. The guest of honor and principal speaker was Griffith Brewer, President of the Royal Aeronautical Society of Great Britain, whose subject was "Fifty Years of Aeronautical Experiences."

### A SENSITIVE FREQUENCY METER

A sensitive 30- to 340-megacycle frequency meter has been designed by E. L. Hall of the Bureau's Radio Section. The meter consists of a variable con-

<sup>1</sup> Published with approval of the Director of the Budget.

denser, coils of sturdy construction, and a resonance indicator. The condenser and resonance indicating system are mounted within a metal box for shielding. The system consists of a 20-microampere d-c meter, a special type of fixed crystal rectifier, and a coupling conductor, connected in series.

The sensitivity of the instrument is such that very loose coupling to an oscillator must be employed. For example, a large deflection is obtained several feet from a 65-megacycle oscillator, using an acorn tube and an input of 0.25 watt. With suitable generators, harmonics including the eighth have been indicated.

The meter has the advantages of extreme sensitivity, great precision of measurement, ready portability, and no batteries or tubes.

#### **DIAPHRAGM-TYPE PRESSURE INDICATORS**

During the development and use of an accurate diaphragm-type indicator of explosion pressures, much information concerning the performance of such instruments was obtained. This has now been compiled by Frank R. Caldwell and Ernest F. Flock, and will appear as RP1368 in the March number of the Journal of Research.

As a result of these studies, an electrical recording system with a time lag of only a few millionths of a second has been devised, and the following conclusions have been reached: (1) All passages and cavities on the explosion side of the diaphragm should be eliminated for highest accuracy; (2) while the sensitivity of the diaphragm to pressure difference must not be less than the value determined by the accuracy with which pressures are to be measured, it cannot greatly exceed this same value lest the inertia error become larger than the allowable tolerance; (3) radial tension in the diaphragm is advantageous in reducing time lag; (4) a blued or polished surface is preferable to one which absorbs more radiation; (5) projections around the diaphragm are without measurable effect upon the performance of the indicator; and (6) it seems probable that, with a properly designed indicator, the measured values of explosion pressure do not deviate from the true value by more than a few tenths of a millimeter of mercury.

#### **SEPARATION OF GASES BY DISTILLATION**

The gas analyst has at his disposal a number of attractive physical methods

which may be invoked in time of need to supplement or even replace the various chemical methods. By far the most useful of these is distillation. Unlike most of the other physical methods, distillation can achieve the actual separation and isolation of the various components of a complex mixture. It can accordingly be used for both analysis and purification of gases, and is not limited (as are many physical methods) to binary mixtures. Although distillation has been used industrially for a long time, its application to gas mixtures in the laboratory is relatively recent, most of the development having taken place during the last 20 years. In the United States, this development was chiefly in answer to the demand of the natural gas and associated industries, and arose from the necessity of knowing, insofar as possible, the actual composition of complex mixtures of hydrocarbons, a determination that could not be made by the time-honored method of combustion. Methods of distillation have since been applied to various gaseous mixtures, and have recently been used by many industrial research laboratories.

In the March Journal of Research (RP1372), Martin Shepherd describes the apparatus and general procedures used at the Bureau for the separation of gases by distillation and rectification at low temperatures. The subject is treated from two viewpoints—analytical separation, and the preparation of pure gases.

#### **THEORY OF THE POTENTIAL AND THE TECHNICAL PRACTICE OF ELECTRODEPOSITION**

During the past 2 years Charles Kasper, of the Bureau, has published four papers dealing with the application of the theory of the potential to the distribution of current in electrolytating. The first, second, and fourth of these papers deal with systems of relatively simple geometrical configuration in which each electrode is at a uniform potential. In the third, consideration is given to the effect of polarization. A fifth paper has now been prepared for publication in the Transactions of the Electrochemical Society, and deals with systems represented by various types of rectangular enclosures with enclosed line electrodes. The paper shows how these systems can be used to analyze such problems in electrodeposition as: (1) The uniform plating of a circular cylinder with an enclosing anode in the form of a square; (2) the use of a wedge to plate an internal right angle,

and the curvature that the apex of the angle must have to make this procedure practicable; and (3) the effectiveness of insulating one wall of a sharp right angle to obtain uniform current distribution over the other wall.

The paper is illustrated with figures showing current flow, the configuration of equipotential surfaces, and current distribution which exist in the model systems. The figures are mathematically derived and are intended to illustrate the opportunities for advancement which are possible if a fundamental approach to problems in electroplating is substituted for the oversimplified notions too often employed for instruction in applied electricity, and too much in evidence in the literature of electro-deposition.

The paper has an extensive section in which is given the purely mathematical treatment of some of the problems involving the theory of the potential as applied to rectangular systems with enclosed line electrodes. This treatment includes some original solutions in addition to a concise record of earlier mathematical developments which make possible the analyses used for illustration.

#### DETERMINATIONS OF HYDROGEN IN IRON AND STEEL

The presence of small amounts of hydrogen as an impurity in iron and steel has been known for a long time. Hydrogen has been blamed for such phenomena as the porosity of ingots, blistering of sheet metal, embrittlement during pickling, and the hardness and brittleness of electrolytic iron, but most of these troubles were ascribed to an "excess" of hydrogen. However, recent experience in the hot-working of metals has shown that hydrogen furnishes an outstanding example of the disastrous effects that may result from the presence of surprisingly small amounts of impurities in metals. Less than 0.001 percent of hydrogen is believed to be responsible for the defects known as "flakes" in forging steels and as "shatter cracks" in railroad rails.

The available methods for determining minute amounts of hydrogen in steel are discussed in a paper (RP1373) by Vernon C. F. Holm and John G. Thompson, which will be published in the Journal of Research for March. The authors found that a method which involves vacuum extraction of the hydrogen at 800° C is rapid and yields reliable results for a variety of materials. Prompt sampling and immediate analysis are advisable because many

samples lose hydrogen during storage, even at room temperature. Alloy steels with high chromium contents dissolve more hydrogen and retain it more tenaciously than do simple steels. Hot-rolled rods of low-carbon steel, some time after they were rolled, had low and uniform contents with no evidence of segregation of the hydrogen.

#### SURFACE HARDNESS OF PRINTING PLATES

The symbols and designs on steel plates intended for intaglio printing may be incised either with an engraving instrument or impressed from a hardened steel roll bearing the embossed configurations. These incising processes are commonly designated as engraving and mechanical transferring, respectively. The hardness of the plate steel at and near its surface, which may differ significantly from that of the underlying or main mass of the steel, is one of the factors believed to have an important bearing on the response of plate steels to the incising treatments. The finishing of the surfaces of plate steels by machining, grinding, and polishing affects the hardness of the surface layers of the plate, which may differ according to the conditions of the finishing treatments and the ability of the steel to work harden.

Harry K. Herschman and Frederick Knoop, working in cooperation with the Bureau of Engraving and Printing, have studied the hardening effects developed in shallow layers of metal adjacent to the ground surfaces of plates of 0.33-percent carbon steel with different microstructures, by finishing under different grinding conditions. Hardness tests were made with the Bureau's diamond indenting tool, which proved admirably suited for evaluating surface hardness in the specimen plates finished with different grinding treatments. (Because of the shallow indentations (approximately 0.0001 to 0.00035 inch for the tests described) made with this indenter, the accuracy of the measurements of surface hardness was influenced by the degree of "smoothness" or "roughness" of the ground surfaces of the specimens. Therefore, the surface finishes were measured and considered in the interpretation of the hardness data.)

The test results, which will be published as RP1374 in the March number of the Journal of Research, show that the hardness of the surface metal, as distinguished from that of the underlying, or main, mass of the metal, may be significantly influenced by the fol-

lowing factors: (1) The cooling conditions during grinding, (2) the depth of the layer of metal removed by each grinding cut, and (3) the grain size of the abrasive wheel employed. However, the rate at which the abrasive wheel passes over the specimens during the grinding operations does not appear to influence the hardening effects. The data obtained, within the limitations of the tests, suggest that surface hardness is independent of the degree of finish of the surface. However, the accuracy of the measurement of surface hardness may be influenced by the finish factor. The hardening effects of the grinding treatments on the steel investigated do not appear to have been influenced by difference of the microstructures of the material. The hardness data secured suggest that the most significant hardening effects of grinding occur in the superficial layers of the steel and that these influences are progressively less for successively deeper adjacent layers.

#### API PIPE-COATING TESTS— FINAL REPORT

Since 1930 the Bureau has cooperated with the American Petroleum Institute, coating manufacturers, and pipe-line owners in a series of pipe-coating tests to establish the engineering principles involved in the design, selection, and application of such coatings. (Technical News Bulletin 283, November 1940.) The final report of this work was presented by Kirk H. Logan at the twenty-first annual meeting of the API, which was held in Chicago on November 14, 1940.

A limited number of copies of this report are now available for distribution to those who can show a real need for the data in their work. Requests should be directed to Soil Corrosion Section, National Bureau of Standards, Washington, D. C.

#### ESTIMATING LOADS IN PLUMBING SYSTEMS

For many years, differences between the plumbing regulations or plumbing code requirements of various localities have been a source of annoyance to builders, owners, and public health officials and have hindered the standardization, on a general or national scale, of plumbing materials and equipment and of construction design. Plumbing codes are intended to protect health and to prevent property damage by water or

sewage, and these objectives should be the same, regardless of the size or cost of the building. Any simplified or standardized form of building construction that meets these requirements cannot be prohibited without violating the inherent rights of building owners and the public. However, the tendency in plumbing codes has been to crystallize certain types of construction, prohibiting the use of simplifications and economies that recent research on the flow in plumbing systems has shown to be safe and satisfactory.

Since 1921 the Bureau has been studying the hydraulics of plumbing systems and is now preparing a series of papers giving the results of this investigation and describing their application. Building Materials and Structures Report BMS65, which has just been released, is one of this series and deals with the estimation of the maximum flow, or "load," that may be anticipated in any given plumbing system in a building, both in the water-supply system and in the drainage system. It also describes the characteristic types of sewage flow that occur in the drainage system and explains how the nature of the flow changes as it passes through the system from the plumbing fixtures to the street sewer.

It is not necessary to design the supply and drainage piping of the plumbing system to take care of the flow of all of the fixtures operating simultaneously. It is possible to establish maximum frequencies of use of the different kinds of fixtures and from these frequencies and the known flow characteristics to compute by the theory of probability the maximum number of fixtures that will be in operation simultaneously for a given fraction of the time, for example, 1 percent of the time. A plumbing system designed to take care, in a wholly satisfactory manner, of the maximum number of fixtures that will be in operation 1 percent of the time, will safely handle double that number, and it is shown that the probability of such an occurrence will be very remote and that it will be of momentary duration.

Tables and charts based on these relations are given for the benefit of designers of plumbing systems, and their use will assure safe and satisfactory operation of the systems designed in this way.

Copies of BMS65 are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

## PROPERTIES OF CERAMIC TALCOSE WHITEWARE

Although beautiful and durable pottery and china have been produced for centuries, the ceramic industry is constantly investigating means to provide the consumer with a better and more economical product. More uniformly prepared raw materials and bodies, and more rapid methods for heating, are essential to modern mass production. This entails more closely controlled methods of test and the formulation of compositions adaptable to streamlined, and highly mechanized manufacturing.

To assist the industry in this development, the Bureau constructed an electrically heated tunnel kiln of semi-commercial size and capable of heating ware on a wide range of temperatures and time cycles. Experiments made in this kiln are described in a report (RPI371) by R. F. Geller and A. S. Creamer, in the March Journal of Research. For the first trials, several hundred specimens of 12 talcose bodies were made, using 3 different forming methods to determine the effects of these methods on the properties of the bodies and on the precision of the data. These data should be of assistance in evaluating the relative merits of the three methods for making laboratory trials. The specimens were then heated in the tunnel kiln on six different cycles to determine the effects of relatively rapid schedules of heating and cooling and thereby throwing further light on the possibilities of speeding manufacturing methods.

The results show that dealred bodies are stronger and more uniform than those prepared by hand-wedging.

Pressed specimens are easily prepared, even of bodies having poor workability, but their maturing range and final properties may differ in important respects from those made of plastic masses. Therefore, specimens should not be made by one method to determine the possibilities of a body made commercially by the other method.

Specimens prepared by dealreding and extrusion averaged, after heating, 3,100 lb/in.<sup>2</sup> stronger than the pressed ones and 2,300 lb/in.<sup>2</sup> stronger than those hand-wedged and extruded, the strength values being expressed as the modulus of rupture in bending.

About one-third of the specimens showed the highest strength after the shortest schedule either to cone 4 or to cone 6. The average strength values for all pressed bodies ranged from 5,400 to 9,400 lb/in.<sup>2</sup> for those heated to cone

4, and from 6,000 to 10,000 lb/in.<sup>2</sup> for those heated to cone 6. Corresponding values for hand-wedged, extruded, bodies ranged from 6,400 to 11,000 lb/in.<sup>2</sup>, and 7,100 to 12,100 lb/in.<sup>2</sup>. For dealred, extruded, bodies the values ranged from 8,700 to 12,600 lb/in.<sup>2</sup>, and 9,700 to 13,500 lb/in.<sup>2</sup>.

Total shrinkage, extensibility, and thermal expansion of any one body were not greatly affected by the various heating cycles. The difference in absorption of specimens heated to cone 4 and to cone 6 was appreciably greater for pressed bodies than for extruded bodies. Several bodies showed an increase in absorption with increase in the length of the heating cycle, but there is no reason to believe that this is caused by overfiring.

After heating to cone 6 on the 9-hour schedule, all of the bodies were vitrified, but after heating to cone 4 only one pressed body and five extruded bodies were nearly or completely vitrified, that is, they showed less than 1 percent of absorption.

## ACTION OF FROST ON BRICKS

The resistance of building bricks made from clay or shale to disintegration by frost is known to depend upon their degree of firing. Bricks that are "hard and well burned" are not visibly affected by many years of exposure to severe climates. The eastern part of the United States provides many examples of brick buildings over 200 years old which are in excellent condition. On the other hand, underburned or "salmon" bricks may disintegrate in a few years or even months of exposure to frost action. Laboratory freezing and thawing is impracticable as a routine acceptance test on account of the time required to complete a significant number of cycles. The available means of predicting, with reasonable accuracy, whether or not a given brick will resist frost action therefore depends upon the correlation existing between durability and certain other properties, such as strength, absorption, and saturation coefficient. Since all of these properties are themselves affected by degree of firing, satisfactory correlation might be expected.

In order to investigate the relation between certain physical properties of bricks and their resistance to freezing and thawing, a laboratory study was begun at the Bureau in 1930, which included determining compressive and transverse strengths, water absorptions, saturation coefficients and either the

number of cycles of freezing and thawing causing failure or the loss in weight after 51 cycles. Most of the bricks were collected in 1930 as part of the survey made by the Bureau in cooperation with the Common Brick Manufacturers Association of America. Additional samples were received in 1936 and 1937.

Building Materials and Structures Report BMS60 presents results of freezing and thawing tests of 3,368 bricks, representing 525 gradings or brands provided by 209 plants, located in 36 States. In addition to the individual results on these bricks, averages for each of 197 additional gradings or samples are given for all results except freezing and thawing. The 197 gradings comprise an additional 1,190 bricks. In addition to numerical data on strengths, absorptions, saturation coefficients, and results of freezing and thawing, information is given concerning the raw materials, methods of manufacturing, and the manufacturer's classification of each sample of bricks. The data are arranged geographically according to producing districts, for each of which a brief summary is provided.

Copies of this publication are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15¢ each.

#### THE CAUSE AND CURE OF LEAKY MASONRY WALLS

In tests previously described in this Bulletin, masonry walls, when subjected to conditions simulating an exposure to rain and wind, were found to have widely different degrees of resistance to water penetration. Some of them leaked large quantities of water in less than 3 minutes, while others withstood a severe test for 5 days. When leakage occurred it took place largely through openings in the joints. The resistance of the joints to leakage depended mostly upon the method of laying the units, and the walls which were most resistant contained either solidly filled vertical joints or a moisture barrier consisting of a coating of mortar within the wall.

The watertightness of joints also was affected by the suction rate of the bricks (water absorbed when partially immersed for 1 minute) at time of laying and the working properties or water retentivity of the mortar. In general, it was found necessary to wet highly absorptive bricks before they were laid in order to obtain masonry highly resistant to rain penetration; in fact, the

wetter the bricks at time of laying the greater the resistance. Tooling the face joints assisted slightly in reducing leakage, but the permeability was governed largely by the quality of the joints in the interior of the walls.

Reducing the number of header bricks in walls of common American bond did not have a significant effect upon the water permeability. Walls composed of a facing of low absorptive brick and a backing of highly absorptive brick gave better performances than similar walls constructed entirely of either type of brick. Walls of structural clay tile or hollow concrete block were not highly resistant to rain penetration unless provided with a facing, such as brick masonry or portland cement stucco, or a coating of cement-water paint applied by means of stiff brushes. The performance of cavity walls containing a 2-inch air space indicated that such walls, when properly flashed, would provide an adequate barrier against water penetration.

In summary, the results indicated that the most serviceable masonry walls are likely to be obtained when the suction rate of absorptive bricks is reduced by wetting prior to use and the joints are well filled with mortar having satisfactory working properties.

Openings in the joints of existing brick walls were sealed satisfactorily by: (1) Raking out the joints to a depth of at least  $\frac{1}{2}$  inch and repointing; (2) scrubbing a 1:1 grout of portland cement and fine sand into the joints by means of small stiff brushes; and (3) applying two coatings of cement-water paint, using stiff fiber brushes. Applications of thin liquid waterproofings retarded the transmission of water by capillarity through the brick but did not seal the relatively large openings in the joints of leaky walls.

#### MOISTURE CONDENSATION IN BUILDING WALLS

Moisture condensation in insulated walls will occur under certain conditions. Building Materials and Structures Report BMS63, which was released a short time ago, discusses these conditions in a general way and makes available to architects, builders, and others, information concerning factors which control humidity in walls. These factors are so presented as to make it possible to estimate the probability of moisture condensation in walls of dwellings and the factors governing it, such as design, structural materials, construction details, and moisture conditions inside and outside the building.

Copies of this publication are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

### IMPROVEMENT OF FIBERBOARD WALLS

The Insulation Board Institute has engaged R. C. Reichel as research associate to work in the Bureau's Paper Section on means for extending the usefulness of fiber insulating boards as interior wall finish. Fiberboard is already in extensive use for this purpose, but because it is necessary to leave a space between boards to prevent buckling from expansion, the decorative treatment has been limited largely to paneling where the cracks could be covered with strips of wood or other materials. The Institute wishes to find a method of constructing fiberboards that will permit the use of any decorative treatment commonly applied to plaster walls.

Panels will be erected with various methods of fastening, joint treatments, and different kinds of decoration now in use, plus such methods as can be developed in the laboratory. The panels will be subjected to extreme conditions of humidity and temperature, and the results will be observed and measured. Particular attention will be paid to warping, buckling, and opening of the joints. The various types of joints and methods of fastening will be tested to determine the adhesion of the boards to studding, and the strength of the joints.

Different methods of surface finishing will be used on the test panels.

### CONTROL OF PAPER EXPANSION IN MULTICOLOR LITHOGRAPHY

The latest development in the treatment of papers to minimize misregister of color prints in offset lithography is essentially the controlled exposure of the paper to correct moisture conditions, an excess of moisture being required.

In the conventional method of conditioning paper for printing, the room atmosphere is blown up around the paper which is hung in a cabinet-like compartment for maximum exposure. The new method employs practically the same equipment and procedure, but water in measured amounts is introduced into the air which is blown around the paper. The water is added in the form of a finely divided spray

to the air entering the conditioning machine.

Paper is correctly stabilized for multicolor printing with respect to dimensions when its moisture content is 0.5 to 0.7 percent above equilibrium with the humidity of the pressroom atmosphere. The new method not only makes possible much faster conditioning than heretofore thought possible, but the moisture content is much more accurately adjusted.

The new method of conditioning has been thoroughly tested in commercial-scale operation with most satisfactory results.

### BASE-COMBINING CAPACITY OF COTTON

It is well recognized that cellulosic materials contain acidic groups which bind ions and accordingly influence the electrical conductivity, the dyeing, and the finishing of the fibers or fabrics.

In an earlier investigation, the relationship between the ash content of cotton fibers and their acid-binding capacity was developed. To study further the acidic properties of cotton, the investigation has now been extended by the research associates of the Textile Foundation to include the direct estimation of the acidic groups in the fiber by titration with alkali. Both monovalent and divalent cations were used in this work. The detailed report (RP1370) by Arnold M. Sookne and Milton Harris will appear in the March Journal of Research.

When dewaxed cotton is freed of its cationic ash electrodialytically, it binds a maximum of 0.065 milliequivalent per gram of either silver or calcium ions, whereas depectinized cotton binds only 0.010 milliequivalent per gram. These values confirm previous estimates of the carboxyl contents of these samples obtained by titration with acid. The identity of the base-binding capacities when mono- and divalent ions are used is a strong indication that the binding of these ions results from an acid-base reaction rather than from some undefined adsorption process. This conclusion was substantiated by esterifying the acidic groups of electrodialyzed depectinized cotton with diazomethane, which thus reduced the base-binding capacity to nearly zero.

It is shown that the maximum silver-binding capacity can be obtained only by the use of the silver salt of a very weak acid. When the salt of a strong acid is used, a sufficient number of hydrogen ions are in the solution to

compete with the silver ions for the acidic groups of the fiber.

The silver-binding capacities of electrodialyzed dewaxed and electrodialyzed depectinized cotton are greater than those of dewaxed and depectinized samples, respectively. This result is explained in terms of competition of silver ions with the cations already on the acidic groups of the fiber.

The number of acidic groups in depectinized cotton is not altered by progressive treatment of the fiber with alkali, a fact which lends support to the tentative conclusion that the acidic groups in depectinized cotton are an integral part of the cellulose molecule.

#### PERMEABILITY OF LEATHER TO WATER VAPOR

One of the physical properties of leather which contributes greatly to its desirability for use as a shoe and garment material is its ability to allow water vapor to pass through it freely. If the perspiration which the normal human foot exudes is not allowed to evaporate, the foot becomes moist, hot, and uncomfortable. Such conditions favor the development of foot troubles and damage to the leather. Good shoe leather permits the water from the perspiration to pass through it very rapidly.

Robert B. Hobbs, Jr., of the Bureau's Leather Section, has devised a method for measuring the permeability of leather to water vapor. It is similar to a method developed for paper and other sheet materials, but embodies modifications which make it more suitable for leather. This method has been used for materials ranging from 1 to 250 mils in thickness, and having transpiration rates from 5 to 1,500 grams of water per square meter per day. Thus it appears suitable for all kinds of leather.

#### APPLICATIONS OF STATISTICAL METHODS TO SAMPLING OF LEATHER

When leather from a particular lot is sampled for the measurement of tensile strength, it is necessary that the sample be economical and, at the same time, adequate to characterize the lot under consideration. The statistical problems involved in determining the size of the sample have been studied by John Beek, Jr., and Robert B. Hobbs, Jr., of the Bureau's Leather Section. They conclude that the variance of a sample is represented as the sum of three variances: The variance among bends; the

variance among the locations sampled; and the variance resulting from local fluctuations. From measurements of tensile strength made in connection with various research projects at the Bureau, the corresponding coefficients of variation are found to be 6, 9, and 11 percent, respectively.

The tensile strength of a bend may be calculated from the tensile strength of a small sample taken from a restricted area if the location index is known. (The location index is defined as the ratio of the tensile strength of a restricted area of the bend to the mean tensile strength of the bend). Location indexes have been calculated for areas in the shoulder portion of the bend.

The results have been applied to the calculation of the size of sample to be taken, for different numbers of bends, of locations in each bend, and of specimens from each location.

#### ACTION OF ENZYMES ON GLYCOSIDES

By crushing almond nuts and extracting with water the defatted, powdered material, a product is obtained containing enzymes which are capable of splitting certain combinations of sugars with alcohols or phenols, called glycosides, into the sugar and the alcohol or phenol. These enzymes, also called glycosidases, are very important to plants and possibly to animals. They also may be useful for commercial processes, and the study of their mode of action is important.

An interesting characteristic of these enzymes is their marked specificity or sensitivity to very small differences in the composition or configuration of the glycoside. One type of specificity is that exhibited by the enzymes to various sugars. In the Journal of Research for March (RP1369), William W. Pigman describes his investigation of the enzymatic splitting of several phenyl glycosides formed by combining a number of sugars not found in natural products with phenol. The object was to determine whether the enzymes under investigation are capable of splitting all combinations of phenol with various sugars, or only certain combinations. As a result, it has been found that the phenyl glycosides of synthetic sugars are affected by the enzymes of almond emulsin only when these sugars are very closely related to the naturally occurring hexoses—Mannose, glucose, and galactose—and when they may be considered to be derived from these natural sugars.

In the ordinary glycoside, the sugar and phenyl radicals are held together by an oxygen atom. The effect of the substitution of a sulfur atom for the oxygen atom of the bonding link was investigated. It was found that the effect is great, and that the sulfur glucoside is split at best only extremely slowly by the enzymes of almond emulsion, although all other parts of the molecule are the same as those of the very easily hydrolyzable phenyl  $\beta$ -glucoside.

#### NEW AND REVISED PUBLICATIONS ISSUED DURING FEBRUARY 1941

##### Journal of Research<sup>2</sup>

**Journal of Research of the National Bureau of Standards**, volume 25, number 6, December 1940 (RP1346 to RP1353, inclusive). Price 35 cents. Annual subscription, 12 issues, \$3.50. **Journal of Research of the National Bureau of Standards**, volume 26, number 1, January 1941 (RP1354 to RP1361, inclusive). Price 20 cents. Annual subscription, 12 issues, \$3.50.

##### Research Papers<sup>2</sup>

(Reprint from November 1940 Journal of Research)

**RP1344. Standard electrodynamic wattmeter and AC-DC transfer instrument.** John H. Park and Arthur B. Lewis. Price 10 cents.

##### Building Materials and Structures Reports<sup>3</sup>

[Persons who wish to be notified of new publications in the Building Materials and Structures series as soon as they are available should write to the Superintendent of Documents, Government Printing Office, Washington, D. C., asking that their names be placed on the special mailing list maintained by him for this purpose.]

**Supplement to Report BMS17. Sound insulation of wall and floor constructions.** V. L. Chrisler. (This supplement reports the results of sound-transmission measurements made on a number of additional types of construction since the issuance of the original report in March 1939.) Price 5 cents.

<sup>2</sup> Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, \$3.50 per year (to addresses in the United States and its possessions, and to countries extending the franking privilege); other countries, 70 cents and \$4.50, respectively.

**BMS60. Strength, absorption, and resistance to laboratory freezing and thawing of building bricks produced in the United States.** John W. McBurney and Joseph C. Richmond. Price 15 cents.

**BMS63. Moisture condensation in building walls.** Harold W. Woolley. Price 10 cents.

**BMS65. Methods of estimating loads in plumbing systems.** Roy B. Hunter. Price 10 cents.

#### MIMEOGRAPHED MATERIAL

##### Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

**LC626. Guide to the literature on rubber.** (Supersedes LC501.)

**LC629. List of Simplified Practice Recommendations, revised to February 1, 1941.** (Supersedes LC612.)

#### RECENT BUREAU ARTICLES APPEARING IN OUTSIDE PUBLICATIONS<sup>3</sup>

**Outdoor exposure test of paints for masonry walls.** Clara Sentel. Circular No. 609, Natl. Paint, Varnish and Lacquer Assn. (1500 Rhode Island Ave., N. W., Washington, D. C.) (January 1941).

The theory of the potential and the technical practice of electrodeposition. I. The general problem and the cases of uniform flow. II. Point-plane and line-plane systems. III. Linear polarization on some line-plane systems. IV. The flow between and to circular cylinders. Charles Kasper. Trans. Electrochemical Soc. (Columbia University, New York, N. Y.) 77, 353 and 365 (1940), and 78, 131 and 147 (1940).

Use of azeotropic distillation in separating hydrocarbons from petroleum. F. D. Rossini, B. J. Mair, A. R. Glasgow, Jr. Proc. Am. Petroleum Inst. (250 Park Ave., New York, N. Y.) 21, 111 (1940); Refiner and Natural Gasoline Mfr. (3301 Buffalo Drive, Houston, Texas), 19, No. 11, 116 (1940); Oil and Gas J. (Tulsa, Okla.), 39, No. 27, 158 (1940).

<sup>3</sup> These publications are not obtainable from the Government, unless otherwise stated. Requests should be sent direct to the publishers.

An improvement in the method for determining moisture in leather. Everett L. Wallace. J. Am. Leather Chemists Assn. (Ridgway, Pa.) 36, 7 (January 1941).

Advances in plastics during 1940. G. M. Kline. Modern Plastics (122 East 42d St., New York, N. Y.) 18, 53 (January 1941).

Induction heating. H. S. Rawdon. Steel (Penton Building, Cleveland, Ohio) 108, 224 (January 6, 1941).

Tensile-elastic properties of typical stainless steels and nonferrous metals. D. J. McAdam and R. W. Mebs. Technical Note 693 (National Advisory Committee for Aeronautics, Washington, D. C.) (January 1941).

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